## Operating the DG8SAQ VNWA from within Linux using Wine

### T. Baier DG8SAQ

November 1<sup>st</sup>, 2019

#### Introduction

As to date the VNWA software is only available for Microsoft Windows platforms, a Windowslike platform needs to be built inside Linux in order to use it. Up to now, this could only be achieved by installing a real Windows operating system inside a virtual machine running on the Linux platform or by running VNWA inside Wine. As Wine still does not support a USB stack, the previous VNWA Wine package circumvented this problem by rerouting the calls VNWA dispatches to the USB driver to a virtual serial com port created with socat, which hooked up to the Linux side. Unfortunately, with the advent of Wine2.x, there are problems connecting Wine to socat. Therefore, the present package implements communication via TCP instead of a virtual serial port. This makes socat as intermediate communication layer unnecessary and thus improves the overall simplicity and stability of the solution.

No special solution is required to connect to the USB audio codec(s) since Wine has already built-in audio support.

The software has been tested on Debian 9 Stretch 32 bit and Ubuntu14.04 64bit.

Mandatory software packages:

- Wine (tested with version 2.0, older versions are fine, too.)
- VNWA installer version 36.7.4 or newer (includes the described Linux package and documentation)

Some systems may require installation of additional packages for usb\_lan\_server to execute, e.g. libusb-dev.

#### Installation

The installation process is described for a Debian Linux system. On other systems use an appropriate package manager, e.g. YAST on OpenSUSE.

This is a step by step installation procedure which tests functionality in intermediate steps.

- 1. Install wine: In a root terminal do: apt-get install wine
- Download the VNWA software installer for Windows (VNWA-installer.exe) and install the VNWA software inside wine skipping driver and certificate installation: wine VNWA-Installer.exe

Important: You need at least VNWA version 36.7.4. The latest installer version can be found here: https://groups.yahoo.com/neo/groups/VNWA/links/all/A1\_DG8SAQ\_001284012495

In the following it is assumed that VNWA was installed into c:\VNWA, which is found in the Linux file system as \$HOME/.wine/drive\_c/VNWA. If you use a different directory, you must later manually change the paths in VNWA.sh.

3. Manually delete the file \$HOME/.wine/drive\_c/VNWA/MagiCal.dll from your installation folder. The Magi-Cal device is NOT supported under Wine.

4. The installer also copies the Linux package to your disk. The Linux files are found in \$HOME/.wine/drive\_c/VNWA/Linux

Copy the following Linux specific installation file provided in the Linux folder to the VNWA installation folder:

- LibUSB0.dll

Copy the most appropriate versions of files found in subfolders of the Linux folder to the Linux folder <code>\$HOME/.wine/drive\_c/VNWA/Linux</code>:

- usb\_lan\_server
- usb\_lan\_testclient
   (make sure the programs are executable: chmod +x usb\_lan\_\* )

Make sure the script VNWA.sh in \$HOME/.wine/drive\_c/VNWA/Linux is executable(chmod +x VNWA.sh ).

The file \$HOME/.wine/drive\_c/VNWA/Linux/AEA9\_VNWA.0.png is the icon for later use on the desktop.

5. Connect the VNWA and check if Linux can see all devices. In a console type lsusb

1	tom@virtual-debian: ~	_ 🗆 🗙
Datei Bearbeiten Ansicht	Suchen Terminal Hilfe	
tom@virtual-debian:~\$ l	susb	1
Bus 001 Device 001: ID :	1d6b:0002 Linux Foundation 2.0 root hub	
Bus 002 Device 001: ID	1d6b:0001 Linux Foundation 1.1 root hub	
Bus 002 Device 002: ID (	0e0f:0003 VMware, Inc. Virtual Mouse	
Bus 002 Device 003: ID (	0e0f:0002 VMware, Inc. Virtual USB Hub	
Bus 002 Device 004: ID 3	20a0:4118 Clay Logic	
Bus 002 Device 005: ID (	08bb:2900 Texas Instruments Japan PCM2900 Audio (	Codec
Bus 002 Device 006: ID (	08bb:29b0 Texas Instruments Japan PCM2900B Audio	CODEC
tom@virtual-debian:~\$		

You should see the VNWA controller with ID 20a0:4118 and one (VNWA2, VNWA3) or two (VNWA3E) PCM2900 USB audio devices as shown above.

6. Normally, only root has raw access to USB devices. So, next, we enable raw USB access for a standard user.

In a root terminal or "sudo" do...

- 6.1. Create a group named usb: addgroup --system usb If the group already exists, you will see an error message. This is ok.
- 6.2. Put yourself into this group: adduser [your username] usb If you are already a group member, you will see an error message. This is ok.
- 6.3. Create the file /etc/udev/rules.d/80-usb.rules
  and add the following single line to it using an editor like nano:
   SUBSYSTEM=="usb" ATTRS{idVendor}="20a0"
   ATTRS{idProduct}=="4118" GROUP="usb" MODE:="0660"
   You may instead simply copy the file 80-usb.rules provided in the Linux package.
- 6.4. Reboot your Linux system or alternatively run: udevadm control --reload-rules && udevadm trigger

7. Now, we test if we can manually access the VNWA controller using the programs usb\_lan\_server and usb\_lan\_testclient previously copied to the \$HOME/.wine/drive c/VNWA/Linux directory. Make sure both are executable.

```
tom@virtualdebian9: ~/.wine/drive_c/VNWA/Linux
Datei Bearbeiten Ansicht Suchen Terminal Hilfe
tom@virtualdebian9: ~/.wine/drive_c/VNWA/Linux$ chmod +x usb_lan_*
tom@virtualdebian9: ~/.wine/drive_c/VNWA/Linux$ ls -l usb_lan*
-rwxr-xr-x 1 tom tom 2078688 Nov 9 11:31 usb_lan_server
-rwxr-xr-x 1 tom tom 2848712 Nov 9 09:27 usb_lan_testclient
tom@virtualdebian9: ~/.wine/drive_c/VNWA/Linux$ ./usb_lan_server -d &
[1] 7724
tom@virtualdebian9: ~/.wine/drive_c/VNWA/Linux$ ./usb_lan_testclient
```

Now, run usb\_lan\_server -d & (-d to get the debug screen, & to detach the process from the console) and usb\_lan\_testclient as shown above.

The server debug screen should indicate that the server is open and listening:

	DG8SAQ USB LAN Server - Debug Mode	×
TCP Serve	r listening to port 56789	

The test client windows should look like this after pressing the Connect-button:

	USB LAN Test-Client	×
Port	Server IP Address	
56789	127.0.0.1	0
Connect	Disconnect	
established	rver with address 127.0.	0.1
1 hellolinux		Send
2 init 3 open		
4 getstrsmp 1 2	56	
5 getstrsmp 2 2	56	
6 close		
7 quit		

Also, the server should notify that the client is connected now.

After the connection is established, press the client's send button to send the preloaded commands to the server. The server should in turn mirror every command and answer and the client should receive the server's answers:

	USB LAN Test-Client	×
Port	Server IP Address	
56789	127.0.0.1	
Connect	Disconnect	
Received: 2 1 1 2 Received: 3 Received: 4 16 1 105 116 115 46 Received: 5 16 6	2 6 19 119 119 46 115 100 110 101 116	114 45 107
Received. 5 10 0	06 /1 00 63 00 61 40 60	78 87 65 32
1 hellolinux 2 init 3 open 4 getstrsmp 1 25	56	5 78 87 65 32 Send
1 hellolinux 2 init 3 open 4 getstrsmp 1 25 5 getstrsmp 2 25	56	5 78 87 65 32
1 hellolinux 2 init 3 open 4 getstrsmp 1 25 5 getstrsmp 2 25 6 close 7 auit	56 56	5 78 87 65 32 Send

Particularly interesting is the answer to the init command  $(1 \ 1 \ 2 \ 6 \ above, marked red)$  which indicates the version of the libusb-driver (here 1.1.2.6). This may vary from system to system, but if the answer is  $0 \ 0 \ 0$ , then there is no VNWA connected or you do not have raw USB access. You may see additional error messages in this case. Also, you may check if missing raw access is causing this problem by running the same programs as root. If successful as root, then you are not granted raw access as a simple non-privileged user.

- 8. Launch the VNWA software by executing \$HOME/.wine/drive\_c/VNWA/Linux /VNWA.sh Note, that on my web book it takes about 10 seconds for VNWA to come up.
- 9. In VNWA go to Options-Setup USB Settings, make sure your VNWA license code is entered correctly and press "Rescan USB Bus". The result should look like this:

i c and instrument hardware Related Setup					
Interface Type USB Settings	Audio Settings Audio Level Instrument Settings Misc. Se	ettings			
Rescan USB Bus	bus/device_idVendor/idProduct / 0x20A0/0x4118				
Test USB Interface	- Manufacturer : www.sdr-kits.net - Product : DG8SAQ-VNWA 3.0				

This proves that the VNWA software can connect to the VNWA hardware.

Note, that in this Linux implementation, the "Rescan USB Bus" feature will always show at most one VNWA device with reduced information (see above). So, only one VNWA may be connected to the computer at the same time.

10. You may check the USB communication including speed by using the "Test-USB Interface" feature in the USB setup:



On my Windows7 HP ProBook the test runs through in about 1 second, while the same test takes about 10 seconds on my Debian Wheezy Acer AspireOne. This is still sufficient to operate the VNWA.

We are not yet ready to measure, but as a further test, you may check if you can control the output frequency of your VNWA in signal generator mode.

11. Next, we have to take care of the audio codecs in Wine, therefore terminate the VNWA application.

12. In a Linux console run winecfg and select the Audio tab:

Laufwerke	Auc	dio	Über
Treiberdiagnose			
Ausgewählter Treibe	r: winepulse.drv	6	
Standarde			
Ausgabegerät:	(Syster	n Standard)	
, and a second sec	107500	n ocanadara,	
Sprachausgabegerät	: (Syster	n Standard)	<b>_</b> _
Eingabegerät:	Pulseau	udio	•
Sprachaingahagaräti	(Systen	n Standard)	
oprachenigabegerac.	Pulseau	idio	

On my Debian machine, Wine 1.6.2 and Wine 1.7.2 and Wine 2.0 refused to detect any of the VNWA USB sound devices, but only showed a device named Pulseaudio:

This can be resolved by deactivating PulseAudio in Wine:

13. Go to the Library tab, enter winepulse.drv and press the apply button:

Laufwerke	1	Audio	Über
Anwendungen	Bibliotheken	Grafik	Desktop-Integration
DLL-Überschreibu	ngen		
entweder Builtin	(gestellt durch Wi	ne) oder Nativ	e (von Windows oder
durch die Anwen	dung gestellt). bung für:		
durch die Anwen Neue Überschreit winepulse.drv	dung gestellt). bung für:		Festlegen
durch die Anwen Neue Überschrei winepulse.drv Bestehende	dung gestellt). bung für:		Eestlegen
durch die Anwen Neue Überschrei winepulse.drv Bestehende	dung gestellt). bung für:		Eestlegen

Confirm that you want to change the loading sequence. Next, press the Edit button,...

Laufwerke		ludio	Über
Anwendungen	Bibliotheken	Grafik	Desktop-Integration
DLL-Überschreibu	ngen		
durch die Anwen	dung gestellt). bung für:		Festlegen
durch die Anwen Neue Überschreil	dung gestellt). bung für:		Eestlegen
durch die Anwen Neue Überschreil Bestehende winepulse.drv (f	dung gestellt), bung für: Native, Builtin)		Eestlegen Bearbeiten

Wine-Konfiguration (als Administrator)

... select "deactivate"...



And confirm by pressing the OK button.

Now, winepulse should show as deactivated:

Laurwerke	in the second second	Audio	Über
Anwendungen	Bibliotheke	n Grafik	Desktop-Integration
DLL-Uberschreibu DLLs (Dynamic Li entweder Builtin durch die Anwen	ngen nk Libraries) k (gestellt durc dung gestellt	können einzeln eir h Wine) oder Nati ).	ngestellt werden, ive (von Windows oder
Neue Überschrei	bung für:	•	Eestlegen
winepulse.drv (a	ausgeschaltet		Bearbeiten
		1	Entfernen

Close winecfg by pressing the OK button, restart winecfg and observe that all input devices are visible now:

Nowendungen	Bibliothe	kon l	Crafik	Deckton-Integrati
Laufwerke	Diblioche	A	Jupio	Über
Treiberdiagnose Ausgewählter Tr	eiber: wine	alsa.drv		
Standards				
Ausgabegerät:		(Syste	em Standard)	)
Sprachausgabeg	jerät:	(Syste	em Standard)	)
Eingabegerät:		(Syste	em Standard)	)
Spracheingabeg	erät:	(Syste In: de In: En	m Standard) fault soniq AudioP B Audio COD	CI - ES1371 DAC2/AD

Close winecfg again.

On an Ubuntu 14.04 64bit system the audio codecs were still not visible in Wine. Here, the following has worked in order to launch Alsa support in Wine:

In a terminal launch

winetricks

and check "Select the default wineprefix":



Press "OK" and then check "Change Wine settings":



Press "OK" and scroll down to and select "sound=alsa":

Paket	Name
	Set Renuel TargetLockMode to readtex
rtlm=texdraw	Set RenderTargetLockMode to texdraw
rtlm=textex	Set RenderTargetLockMode to textex
sandbox	Sandbox the wineprefix - remove links to /home/tom
🗹 sound=alsa	Set sound driver to ALSA
sound=coreaudio	Set sound driver to Mac CoreAudio
sound=disabled	Set sound driver to disabled
sound=oss	Set sound driver to OSS
strictdrawordering=disabled	Disable StrictDrawOrdering (default)
strictdrawordering=enabled	Enable StrictDrawOrdering
vd=1024x768	Enable virtual desktop, set size to 1024x768

Press "OK" and then close Winetricks by clicking the "x".

Launch  ${\tt winecfg}$  and you should see the VNWA USB audio codecs now.

Most interestingly, using above trick makes deactivating pulseaudio in Wine unnecessary.

We are ready now to set up VNWA.

# 14. Launch VNWA again by running ./VNWA.sh inside the Linux folder of the VNWA installation directory.

Audio Capture Device		Misc Audio Settings	
In: USB Audio CODEC - I	JSB Audio ADC Resolution ADC Resolution 8 Bit 16 Bit 24 Bit 48000 Hz	Audio Buffer Length in Samples Samples / IF Period 10 ×4 # Presamples 3 # Postsamples 3 Calibrate Sample Rate	3000 => IF = 1200.00 Hz => Minimum Sampling Time = 0.96 ms
Max=15921 ✓ Auxiliary Audio Capture	Min=-15906 e Device available	Sample Rate = UnCal.	ignore overload
Auxiliary Audio Capture De In: USB Device 0x8bb:0x	vice 2900 - U	Auxiliary Audio Settings Aux. Audio Channels measure THI	
Min=-13893	ADC Resolution C 8 Bit G 16 Bit C 24 Bit Max=13897	Main Audio Channels measure RE Sample Rate = UnCal. Aux. Reference = Right Channel	FLECT
Auto-Setup Audio Device	es Check USB codecs only		

Go to Options-Setup-Audio Settings and select the appropriate Audio Capture Devices:

Press "Test Audio" and check if you can open the selected Audio devices. Check in Audio Level if you see signals from the VNWA:



Note, that above sine waves may also be triangular depending on audio settings. This is ok.

If you observe phase jumps in the audio stream, this is a sign that the Wine audio driver drops data packages from the codec(s). In this case, reduce the sample rate from 48ksps to e.g. 24ksps. There are reports that this has cured a data loss problem. You may also experiment with increasing the audio buffer length from 3000 samples to e.g. 6000 samples.

- 15. As the VNWA3E normally has two identical USB sound chips built-in, accessing these from Wine poses a bit of a challenge. Since they share the same name, VNWA inside Wine can only access one of them (unless by chance you have two different PCM2900 subtypes built-in). There is still a possibility to access both of them simultaneously.
  - a) Quick and dirty:

First find out, which codec VNWA can access directly in Wine using the AudioLevel feature in VNWA setup.

	Audio	
Viedergabelautstärke: 🌒 😑	U 100%	
Ausgabe Eingang Hardwar	e Klangeffekte Anwendung	gen
Aufnahmelautstärke: 👲 =	100%	
Aufnahmepegel:		
Wählen Sie ein Gerät zur To	oneingabe:	
PCM2900 Audio Codec A	nalog Stereo	
PCM2900B Audio CODE	C Analog Stereo	

Next, make the other codec the default capturing device in Linux:

By setting the unseen USB codec to be the default one as seen above, Wine can access it under the name "default" and thus can access both after all:

Audio Canture Device	searings Audio searings   Audio Lever  .	Aux. Audio Level   Instrument Settings   Misc. Settin	ða
default Test Audio Max= ✓ Auxiliary Audio Ca	ADC Resolution S Bit 16 Bit 24 Bit 48000 Hz Min= apture Device available	<ul> <li>Audio Buffer Length in Samples</li> <li>Samples / IF Period 1 x4 =&gt; IF</li> <li># Presamples 2 =&gt; Mi</li> <li># Postsamples 2</li> <li>Calibrate Sample Rate</li> <li>Measd. Sample Rate = 47999.7 ignore</li> <li>Reference = Left Channel restart</li> </ul>	3000 = 11999.93 Hz nimum Sampling Time = 0.17 ms overload
Auxiliary Audio Captur default USB Audio CODEC HDA Intel - ALC268 /	USB Audio Analog	Auxiliary Audio Settings Aux. Audio Channels measure THRU Main Audio Channels measure REFLECT Measd. Sample Rate = 47999.7	
Min=	Max=	Aux. Reference = Right Channel	2
Auto-Setup Audio D	evices check all codecs		

b) The sophisticated way (many thanks to Michael for providing this method!)

It is possible to alias sound devices inside Wine with unique names:

i. In a Linux terminal window list your Alsa device config by executing the command arecord -1



More details can be obtained by running cat /proc/asound/cards --

- ii. In my case the two VNWA USB codecs are found as card1/subdevice0 (name CODEC) and card2/subdevice0 (name CODEC\_1) respectively. We do need these numbers or names for identification in order to create valid ALSA addresses for the two VNWA codecs.
- Next, inside the Linux terminal execute wine regedit
   Browse to the registry key shown below...



... and add a multipart character sequence entry with name **ALSAInputDevices** by right-clicking into the right white field of key **winealsa.drv**.

The result should look like this:

	Registry-Editor		- 0
Registry Bearbeiten Ansicht Eavoriten Hilfe			
🖃 🕮 Arbeitsplatz 📃 🔺	Name	Тур	Daten
HKEY_CLASSES_ROOT	(Standard)	REG_SZ	(Wert nicht gesetzt)
	ALSAInputDevices	REG_MULTI_SZ	
AppEvents			
🕀 🛄 Control Panel			
H Colored Layout			
E Wine			
Debug			
DllOverrides	1		
Drivers			
🗄 📥 winealsa.drv	1		
🕀 🧰 devices			
winepulse.drv			
🕀 🧰 FileOpenAssociations	1		
🕀 🧰 Fonts	1		
- MenuFiles	1		
😟 🛄 Temporary System Para			
Volatile Environment	1		
	•		
I HKEY_USERS			
⊞ HKEY_CURRENT_CONFIG     ▼			-i
	14		

Double-click the entry ALSAInputDevices and enter valid ALSA addresses (hw:card number, subdevice number) of the VNWA codecs containing the numbers previously found with <code>arecord -l</code>:



Press OK when done. The result should look like this:



Close the registry editor.

iv. You may run winecfg to verify that the renaming has worked:

nwendungen Biblioth	neken Grafik Audio	Desktop-Ir	ntegration		
Treiberdiagnose Ausgewählter Treiber: wir	nealsa.drv				
Standards					
Ausgabegerät:	(System Stand	ard)	•		
Sprachausgabegerät:	(System Stand	ard)	-		
Eingabegerät:	(System Stand	ard)	-		
Spracheingabegerät:	In: hw:1,0 In: hw:2,0				
Sound testen	In: hw:CODEC In: hw:CODEC In: USB Audio (	_1 CODEC - USB Audio			

Now, indeed four additional input devices with names hw:1,0, hw:2,0, hw:CODEC and hw:CODEC\_1 are available. The two VNWA3E USB codecs may be accessed via these unique names. If you later add or remove audio codecs to your system, the card numbers may change. Thus the hw:CODEC\* devices may be superior as they may also be found after the system audio configuration has changed.

v. Launch VNWA, go to Setup-Audio Settings and find and select the new sound devices there:

Misc Audio Settings           Audio Bulfer Length in Samples         3000           Samples / IF Period         10         x4         => IF = 1200.00 Hz           # Presamples         3         => Minimum Sampling Time = 0.96 ms           Calibrate Sample Rate          0.96 ms
Sample Rate = UnCal.
Reference = Left Channel 💽 restart on no sync
Auxiliang Audio Seturings Aux: Audio Channels measure THRU Main Audio Channels measure REFLECT Sample Rate = UnCal. Aux: Reference = Right Channel

From my experience, it appears that hw:2,0 (or CODEC\_1, i.e. the device with the highest card number) is always the main codec independent of the USB port used for the VNWA, but better double-check using the AudioLevel tab. The main codec is the one where one signal changes when toggling between Thru and Reflect.

- 16. Now, do a normal setup as described in the VNWA documentation.
- 17. Extend the VNWA synchronization period by 5 seconds as shown below:

PC and Instrument Hardware Related Setup

VNWA_Mastercal.cal Browse a					
Data Logging and User Postprocessing Options data logging OFF 💽 💉 Save to 🚺	Brow				
postprocessing OFF 💽 User DLL	Brow				
Special Settings don't autosave instrument state on entering setup update traces at end of sweep only (save CPU time) Extend synchronization period by 5 secs show sweep statistics	Debug Settings write audio data to file do not normalize to reference channel deactivate RF DDS deactivate L0 DDS slow down LPT (LPT mode only!)				
Signal Generator RF Frequency Frequency Offset LO - RF +M +k + 5 MHz  0.01199993 MHz	Instrument Monitoring Instrument Temperature = 32 Deg. Celsiu Temperature offset correction value = -0.3 Deg. Celsiu				



Now, the VNWA system is ready to do measurements:

18. Adding a desktop icon for VNWA:

Create the file VNWA.desktop in your desktop directory, typically \$HOME/desktop (or \$HOME/Arbeitsfläche for German systems) with the following contents (replace tom by your own username, you may use the file template from the Linux package):

```
[Desktop Entry]
Version=1.0
Type=Application
Name=VNWA
Comment=VNWA
Exec=/home/tom/.wine/drive_c/VNWA/Linux/VNWA.sh
Path=/home/tom/.wine/drive_c/VNWA/Linux
Icon=/home/tom/.wine/drive_c/VNWA/Linux/AEA9_VNWA.0.png
Terminal=false
StartupNotify=true
GenericName=VNWA
```

Make the file executable: chmod +x VNWA.desktop

Now you should see an icon on your desktop with which you can launch the VNWA application:

Computer	Anwendungen	Orte										Di,
Computer       DG85AQ - Vector Network Analyzer Software - DG85AQ licensed to DG85AQ         Image: Dome       Elle Measure Settings Tools Options Help         Image: Dome       Image: Dome         Image: Dome       Image:								1	â			
File Measure Settings Iools Options Help         home         IOd8/         IOd8	Compute	ſ	DG8SAG	– Vector	Networ	k Analyze	Softwar	e - DG8S	AQ licensed t	o DG8SAQ		×
home     10dB/       Image: State = 1 MHz       State = 1 MHz       Center = 30.5 MHz       Span = 59 MHz       State = 0 dB       Image: State = 0 dB </td <td>合</td> <td>.E</td> <td>le Measure S</td> <td>iettings <u>I</u>ools</td> <td>Options</td> <td>Help</td> <td>Jorena</td> <td></td> <td></td> <td>1</td> <td></td> <td>Ref1</td>	合	.E	le Measure S	iettings <u>I</u> ools	Options	Help	Jorena			1		Ref1
Image: State 1 MHz       Center = 30.5 MHz       Stop = 60 MHz         Image: State 1 MHz       Center = 30.5 MHz       Stop = 60 MHz         Image: State = 0 dB       Image: State = 0 dB       Image: State = 0 dB         Image: State = 0 dB       Image: State = 0 dB       Image: State = 0 dB         Image: State = 0 dB       Image: State = 0 dB       Image: State = 0 dB         Image: State = 0 dB       Image: State = 0 dB       Image: State = 0 dB         Image: State = 0 dB       Image: State = 0 dB       Image: State = 0 dB         Image: State = 0 dB       Image: State = 0 dB       Image: State = 0 dB         Image: State = 0 dB       Image: State = 0 dB       Image: State = 0 dB         Image: State = 0 dB       Image: State = 0 dB       Image: State = 0 dB         Image: State = 0 dB       Image: State = 0 dB       Image: State = 0 dB         Image: State = 0 dB       Image: State = 0 dB       Image: State = 0 dB         Image: State = 0 dB       Image: State = 0 dB       Image: State = 0 dB         Image: State = 0 dB       Image: State = 0 dB       Image: State = 0 dB         Image: State = 0 dB       Image: State = 0 dB       Image: State = 0 dB         Image: State = 0 dB       Image: State = 0 dB       Image: State = 0 dB         Image: State = 0 dB       Image: State =	home	10	dB/									IdB
Krusader       Start = 1 MHz       Center = 30.5 MHz       Stop = 60 MHz         Start = 1 MHz       Center = 30.5 MHz       Stop = 60 MHz         Span = 59 MHz       Stop = 60 MHz       Stop = 60 MHz         Span = 59 MHz       Stop = 60 MHz       Stop = 60 MHz         WWA USB Mode started.       Still dB       Single Sweep											ci Q	Ref2 )dB
Stat = 1 MHz Stat = 1 MHz Stat = 0 dB TX Att = 0 dB S21  ↓ Mem 1  ↓  ♥ S11 dB Root Terminal WWA USB Mode started.	Krusader	r										
Image: Tx Att. = 0 dB     Image: S21 dB     Continuous       Single Sweep       Root Terminal     VNWA USB Mode started.			Start = 1 MH	z			Center = Span =	30.5 MHz 59 MHz			Stop = 60 MHz	
Single Sweep       Root Terminal     WWA USB Mode started.	#	<= XI =	Att. = 0 dB	(I.e	I S21	dB					Continuo	us
	Root T <u>ermi</u>	nal Vi	IWA USB Mode s	II Mem 1 💌	IM \$11	dB					Single Swe	sep

You may have to make desktop icons visible on your Linux system using the  $\tt dconf-editor.$ 

END